physics in technology

Volume 12 1981

physics in technology

Volume 12 1981
Pages 1–284

Published by
The Institute of Physics
London and Bristol

Copyright © 1981 by The Institute of Physics and individual contributors.
All rights reserved.

Multiple copying of the contents or parts thereof without permission is in breach of copyright. Permission is usually given upon written application to the Institute to copy illustrations and short extracts from the text of individual contributions provided that the source (and, where appropriate, the copyright) is acknowledged. The code at the bottom of the first column or page of an article in this periodical indicates that copies of the article may be made in the USA for personal or internal use, on condition that the copier pay the stated per copy fee to the Copyright Clearance Centre Inc., for copying beyond that permitted by sections 107 and 108 of the US Copyright Law.

Published by
The Institute of Physics
47 Belgrave Square, London SW1X 8QX

Printed in Great Britain by Henry Ling Ltd, Dorchester, Dorset DT1 1HD. Set in 9/10pt Times

physics in technology

Chairman and Honorary Editor
A Reddish F Inst P

Editorial Board
C G Cannon B Sc F Inst P
M G Clark MA Ph D FRSC C Chem F Inst P
R F Coe M Sc M Inst P
P Gummett M Sc Ph D
G J van Gurp Ph D
C J LaBlonde MS (until May 1981)
J V P Long Ph D M Inst P
R S Nelson B Sc D Sc
W K Pendleton MS Ph D (from June 1981)
K H Spring M Sc Ph D FIEE F I Mech E
E J Whitmore Ph D F Inst P

Executive Editor
K F G Paulus Ph D M Inst P

Staff Editor
A P Ashby B Sc MAIE

Contents of Volume 12 1981

January

3 The shrinking transistor in VLSI: F M Klaassen
10 Industrial hazards of electrostatics: J F Hughes
16 Tin cries – but most materials talk: M Arrington
24 Semiconductor and microelectronic sensors: A P Dorey

Conference reports 29 *Book reviews* 34
Talking point 37

March

45 Physical principles of advanced battery design: A Hooper and P McGeehin
54 Applications of electrostatics: J A Cross
60 Earthquake prediction: B K Atkinson
69 Technological applications of Langmuir–Blodgett films: G G Roberts and P S Vincett, W A Barlow

Editorial: The academic engineer 43
Conference reports 76 *Book reviews* 82
Talking point 88

May

97 Machinery noise considerations at the design stage: N A Halliwell
103 Compressed air storage: I Glendenning
111 Recent progress in scanning acoustic microscopy: H K Wickramasinge
114 Functional neuromuscular stimulation: P H Peckham
122 Thunderstorm electricity: A J Illingworth and P R Krehbiel

Editorial: Cooperation 95
Book reviews 129 *Conference reports* 134
Talking point 140

July

149 Ferromagnetic resonance flaw detection: B A Auld
155 Microwave drying of porous materials: S Lefeuvre
162 Millimetre wave astronomy: E-J Blum
170 The management of radioactive wastes: R M Lodge

Editorial: The growing importance of microwaves 147
Conference reports 175 *Book reviews* 178
Talking point 182

September

187 Glass as an engineering material part 1: M G Britton
196 Ink jet printing: M R Keeling
204 Spin-off from basic science: the case of radioastronomy: B R Martin and J Irvine
213 Thermal energy storage: W E J Neal

Conference reports 221 *Book reviews* 227
Talking point 231

November

240 Technological innovation and competitiveness in the tractor industry: R W Coombs, M Gibbons, P P Saviotti and P C Stubbs
245 Rechargeable metallic hydrides for hydrogen storage: H C Angus
251 Asbestos and health: P E Harley
258 Glass as an engineering material part 2: M G Britton
263 High gradient magnetic separation: M R Parker

Editorial: Long term energy strategies 239
Book reviews 269 *Conference reports* 271
Talking point 277

physics in technology

Index to Volume 12 1981

Subject index

Articles, reports on conferences (C) and editorials (E) are referenced cyclically by keywords of title

academic engineer, The (*E*) 43
acoustic emission: Tin cries – but most materials talk 16
acoustic microscopy, Recent progress in scanning 111
Aerosols in science, medicine and technology – physical and chemical properties (*C*) 134
air storage, Compressed 103
Asbestos and health 251
aspheric optics, Int. symp. on (*C*) 77
astronomy, Millimetre wave 162

basic science: The case of radioastronomy, Spin-off from 204
battery design, Physical principles of advanced 45
building envelopes (Thermosense III), Thermal infrared sensing applied to energy conservation in (*C*) 30

composites, Application and design of fibrous (*C*) 29
Compressed air storage 103
Cooperation (*E*) 95

diffraction (Inter/Micro '81) Int. symp. on microscopy and x-ray (*C*) 275
drying of porous materials, Microwave 155

Earthquake prediction 60
economic viability, Solar energy in the 80s – technological and (*C*) 31
education, 1981 int. conf. on energy (*C*) 271
electricity, Thunderstorm 122
Electronics update '80 (*C*) 76
electronics update: Recent progress in scanning acoustic microscopy 111
electrostatics, Applications of 54
electrostatics, Industrial hazards of 10
electrotechnical conference (Melecon '81), 1st Mediterranean (*C*) 222
energy concepts, 3rd int. conf. on future (*C*) 135
energy conservation in building envelopes (Thermosense III), Thermal infrared sensing applied to (*C*) 30
energy education, 1981 int. conf. on (*C*) 271
energy in the 80s – technological and economic viability, Solar (*C*) 31
energy processes, Symposium on instrumentation and control for fossil (*C*) 224
energy storage, Thermal 213
energy strategies, Long term (*E*) 239
engineer, The academic (*E*) 43
engineering material parts 1 and 2, Glass as an 187, 258

Ferromagnetic resonance flaw detection 149
fibrous composites, Applications and designs of (*C*) 29
flaw detection, Ferromagnetic resonance 149
fossil energy processer, Symp. on instrumentation and control for (*C*) 224
Functional neuromuscular stimulation 114
fusion technology, 11th symp. on (*C*) 32

Glass as an engineering material parts 1 and 2 187, 258

hazards of electrostatics, Industrial 10
health, Asbestos and 251

Human error and its industrial consequences (*C*) 138
hydrogen storage, Rechargeable metallic hydrides for 245

industrial consequences, Human error and its (*C*) 138
industrial environment, Research in a declining (*C*) 80
Industrial hazards of electrostatics 10
industry, Technological innovation and competitiveness in the tractor 240
infrared imaging instrumentation and applications, *J. Phys. E* seminar on developments in (*C*) 273
infrared sensing applied to energy conservation in building envelopes (Thermosense III), Thermal (*C*) 30
Ink jet printing 196

Langmuir–Blodgett films, Technological applications of 69
laser radar conf. (10 ILRC), 10th int. (*C*) 79

Machinery noise considerations at the design stage 97
magnetics conference (Intermag '81), 19th int. (*C*) 221
magnetic separation, High gradient 263
material parts 1 and 2, Glass as an engineering 187, 258
materials, Microwave drying of porous 155
materials talk: acoustic emission, Tin cries – but most 16
metallic hydrides for hydrogen storage, Rechargeable 245
microelectronic sensors, Semiconductor and 24
microprocessors to spectroscopy, Applications of (*C*) 176
microscopy and x-ray diffraction (Inter/Micro '81), Int. symp. on (*C*) 275
microscopy, Recent progress in scanning acoustic 111
Microwave drying of porous materials 155
microwaves: Ferromagnetic resonance flaw detection 149
microwaves, The growing importance of (*E*) 147
Millimetre wave astronomy 162

neuromuscular stimulation, Functional 114
noise considerations at the design stage, Machinery 97

optics, Int. symp. on aspheric (*C*) 77

patents, Scientific (*C*) 136
photovoltaic specialists conference, 15th (*C*) 223
policy in the new socio-economic context, Science (*C*) 78
porous materials, Microwave drying of 155
printing, Ink jet 196

radar conf. (10 ILRC), 10th int. laser (*C*) 79
radioactive wastes, The management of 170
radioastronomy, Spin-off from basic sciences: The case of 204
Research in a declining industrial environment (*C*) 80
Robot vision and sensory controls (1st RoViSeC) (*C*) 272

scanning acoustic microscopy, Recent progress in 111
Science policy in the new socio-economic context (*C*) 78
science: the case of radioastronomy, Spin-off from basic 204
Semiconductor and microelectronic sensors 24
sensing applied to energy conservation in building envelopes (Thermosense III), Thermal infrared (*C*) 30
sensory controls (1st RoViSeC), Robot vision and (*C*) 272
separation, High gradient magnetic 263
socio-economic context, Science policy in the new (*C*) 78
Solar energy in the 80s – technological and economic viability (*C*) 31
spectroscopy, Applications of microprocessors to (*C*) 176
storage, Compressed air 103
storage, Rechargeable metallic hydrides for hydrogen 245
storage, Thermal energy 213

technological and economic viability, Solar energy in the 80s – (*C*) 31
Technological applications of Langmuir–Blodgett films 69
technology, 11th symp. on fusion (*C*) 32
Thermal energy storage 213
Thermal infrared sensing applied to energy conservation in building envelopes (Thermosense III) (*C*) 30
Thunderstorm electricity 122
tractor industry, Technological innovation and competitiveness in the 240
transistor in VLSI, The shrinking 3

Vehicle design (*C*) 175
VLSI, The shrinking transistor in 3

x-ray diffraction (Inter/Micro '81), Int. symp. on microscopy and (*C*) 275

Authors (with article title)

(E) denotes editorial

Angus H C: Rechargeable metallic hydrides for hydrogen storage 245
Arrington M: Tin cries – but most materials talk 16
Ashby A: The academic engineer (*E*) 43
Atkinson B K: Earthquake prediction 60
Auld B A: Ferromagnetic resonance flaw detection 149

Baker-Counsell J: Growing technology support from SRC 182
Barlow W A: see Roberts G G
Blum E-J: Millimetre wave astronomy 162
Britton M G: Glass as an engineering material parts 1 and 2 187, 258

Coe R F: Long term energy strategies (*E*)
Coombs R W, Gibbons M, Saviotti P P and Stubbs P C: Technological innovation and competitiveness in the tractor industry 240
Cross J A: Applications of electrostatics 54

Dorey A P: Semiconductor and microelectronic sensors 24

Gibbons M: see Coombs R W
Glendenning I: Compressed air storage 103
van Gurp G J: Cooperation (*E*) 95

Halliwell N A: Machinery noise considerations at the design stage 97
Harley P E: Asbestos and health 251
Hooper A and McGeehin P: Physical principles of advanced battery design 45
Hughes J F: Industrial hazards of electrostatics 10

Illingworth A J and Krehbiel P R: Thunderstorm electricity 112
Irvine J: see Martin B R

Keeling M R: Ink jet printing 196
Klaassen F M: The shrinking transistor in VLSI 3
Krehbiel P R: see Illingworth A J

Lefeuvre S: Microwave drying of porous materials 155
Lodge R M: The management of radioactive wastes 170

McGeehin P: see Hooper A
Martin B R and Irivine J: Spin-off from basic science: the case of radioastronomy 204

Neal W E J: Thermal energy storage 213

Parker M R: High gradient magnetic separation 263
Peckham P H: Functional neuromuscular stimulation 114

Raoult G: The growing importance of microwaves (*E*) 147
Roberts G G and Vincett P S, Barlow W A: Technological applications of Langmuir–Blodgett films 69

Saviotti P P: see Coombs R W
Sekulin R: Holographic optics for bubble chambers 143
Shaw C J: Physics in archaeology 233
Stubbs P C: see Coombs R W
Swarbrick A: Women in technology 140

Vincett P S: see Roberts G G

Wickramasinge H K: Recent progress in scanning acoustic microscopy 111

Conferences reported (by date)

10–15 August 1980	Applications and design of fibrous composites	29
2–5 September 1980	Thermal infrared sensing applied to energy conservation in building envelopes (Thermosense III)	30
12 September 1980	Solar energy in the 80s – technological and economic viability	31
15–19 September 1980	11th symp. on fusion technology	32
6–9 October 1980	10th int. laser radar conf. (10 ILRC)	79
13 October 1980	Science policy in the new socio-economic context	78
22–23 October 1980	Int. symp. on aspheric optics	77
22–24 October 1980	Aerosols in science, medicine and technology – physical and chemical properties	134
28 October 1980	Electronics update '80	76
26 November 1980	Research in a declining industrial environment	80
17 December 1980	Human error and its industrial consequences	138
16 January 1981	Scientific patents	136
27–30 January 1981	3rd int. conf. on future energy concepts	135
27 February 1981	Vehicle design	175
4 March 1981	Applications of microprocessors in spectroscopy	176
1–3 April 1981	Robot vision and sensory controls (1st RoViSeC)	272
29 April 1981	*Journal of Physics E* seminar on developments in infrared imaging instrumentation and applications	273
12–15 May 1981	15th photovoltaic specialists conf.	223
12–15 May 1981	19th int. magnetics conf. (Intermag '81)	221
24–28 May 1981	1st Mediterranean electrotechnical conf. (Melecon '81)	222
8–10 June 1981	Symp. on instrumentation and control for fossil energy processes	224
14–16 July 1981	Inter/Micro '81: Int symp. on microscopy and x-ray diffraction	275
4–7 August 1981	1981 int. conf. on energy education	271

Physics in Technology is an international magazine covering the whole spectrum of the application of physics to technology and engineering. Through original reviews, editorials, reports and news articles it aims to discuss developments wherever physics is relevant: in innovation, in technical change and in society at large. Articles are normally invited, but suggestions for contributions are welcomed.

Honorary Editor

A Reddish (Open University)

Editorial Board

C G Cannon (Bristol University)
R F Coe (Lucas Research Centre)
P Gummett (Manchester University)
C J LaBlonde (European Office of Aerospace, London)
J V P Long (Cambridge University)
K H Spring (British Railway Board)
G J van Gurp (Philips Research Laboratories, The Netherlands)

Executive Editor

K Paulus

Staff Editor

A Ashby

Editorial address

Editorial enquiries should be addressed to:
Physics in Technology,
The Institute of Physics
(Publishing Division),
Techno House, Redcliffe Way,
Bristol BS1 6NX, England
Telephone 0272-297481, Telex 449149

Bibliographic codes

CODEN: PHYTBK 12(1) 1–40 1981
ISSN: 0305–4624

Subscription information

Physics in Technology is published bimonthly (January, March, May, July, September and November) by The Institute of Physics, 47 Belgrave Square, London SW1X 8QX, England, in association with the American Institute of Physics, and is printed in Great Britain by Henry Ling Ltd, Dorchester, Dorset DT1 1HD.

Printed in Great Britain

Members' reduced rate

Members of The Institute of Physics and some other learned societies are entitled to *Physics in Technology* at the reduced subscription rate of £16 per annum.
Enquiries should be addressed to:
Marketing Manager, The Institute of Physics, Techno House, Redcliffe Way, Bristol BS1 6NX.

1981 volume

1. For all countries *except* the United States, Canada and Mexico the subscription rate is £45 per annum.
Delivery by surface mail within Europe and by air speeded service to most countries outside Europe.
Orders to: Physics Trust Publications, Blackhorse Road, Letchworth, Herts SG6 1HN, England.

2. For United States, Canada and Mexico. Subscription rate US $112.50 per annum (air freight). Second class postage paid at Woodbury, NY and additional mailing offices.
Orders to: American Institute of Physics, Department N/M, 335 East 45th Street, New York, NY 10017, USA.

Air mail rates on application.

1980 volume

Orders to the addresses above.

1979 and earlier volumes

Orders to: Wm Dawson and Sons Ltd, Back Issues Department, Cannon House, Folkestone, Kent CT19 5EE, England.

Single issues £9. All orders to:
Physics Trust Publications

Copyright ©1981 by The Institute of Physics and individual contributors. All rights reserved. Multiple copying of the contents or parts thereof without permission is in breach of copyright. Permission is usually given upon written application to the Institute to copy illustrations and short extracts from the text of individual contributions provided that the source (and, where appropriate, the copyright) is acknowledged.

The code at the bottom of the first column or page of an article in this periodical indicates that copies of the article may be made in the USA for personal or internal use, on condition that the copier pay the stated per copy fee to the Copyright Clearance Centre Inc., for copying beyond that permitted by sections 107 and 108 of the US Copyright Law.